What is claimed is:

1. A method for making a holey fiber comprising the following steps:

(a) stacking structures of at least two different materials of lower and higher softening points in a desired arrangement to form a bundle containing interstices between the structures;

(b) heating the bundle to a fusion temperature which is below softening point of the higher softening point material to form a fused element whereby the lower softening point material softens and flows around the higher softening point material and closes the interstices, with the higher softening point material retaining its shape;

(c) removing the structures of the higher softening point material from the fused element to form a preform, thus forming channels in the fused element; and

(d) drawing the preform at a draw temperature which is below the softening point of the lower softening point material to form the holey fiber.

2. The method of claim 1 wherein the fusion temperature is 50°C to 200°C below the softening point of the higher softening point material and the draw temperature is within 70°C below the softening point of the lower softening point material.

3. The method of claim 1 including the step of applying a partial vacuum to the bundle to remove air therefrom.

4. The method of claim 3 wherein the partial vacuum is on the order of a few psi.

5. The method of claim 4 wherein the structures of the lower softening point material are glass rods and the structures of the higher softening point material are glass tubes.

6. The method of claim 7 wherein the rods are 0.5 mm to 5 mm in outside diameter and the

tubes are 0.5 mm to 5 mm in outside diameter with inside diameter of 0.4 mm to 4.8 mm.

7. The method of claim 8 wherein the holey fiber is made of glass selected from the group consisting of a silicate glass, a silica glass, a fluoride glass, a chalcogenide glass and mixtures thereof.

8. The method of claim 6 wherein the structures of the lower and the higher softening point materials are tubes.

9. The method of claim 8 wherein said step of removing the structures of the higher softening point material is carried out by etching the structures with an acidic aqueous solution.

10. The method of claim 1 wherein the structures of the higher softening point material are rods and said step of removing the structures of the higher softening point material is carried out by heating the fused element in a oxidizing environment.

11. The method of claim 8 including the step of stacking tubes of the higher softening point material in the central region of the bundle for forming a holey fiber with a hollow core.

12. The method of claim 1 including the step of applying a partial vacuum to the bundle to remove air thereform, and including the step of inserting a holey fiber into a clad tube made of the same lower softening point glass to form a complex structure and drawing the complex structure to from a holey fiber of reduced cross-section.

13. The method of claim 8 including the step of providing a clad tube around the structures in the formation of the bundle, the clad tube is of the lower softening point glass and spaces between the clad tube and the structures are filled during the fusion operation.

14. The method of claim 1 wherein the fusion temperature is within 50°C below the softening

point of the lower softening point material and the draw temperature is within 30°C below the softening point of the lower softening point material.

15. A method for making a holey fiber comprising of the following steps:

(a) stacking structures of at least two different materials, one being a glass with a softening point and another being a non-glass that is rigid at the softening point of the glass to form a bundle containing interstices between the structure;

(b) heating the bundle to a fusion temperature which is near the softening point of the glass to form a fused element whereby the glass softens and flows around the non-glass structures and closes the interstices;

(c) removing the non-glass structures from the fused element to form a preform, thus forming channels in the fused element; and

(d) drawing the preform at a draw temperature which is near the softening point of the glass to form the holey fiber.

16. The method of claim 15 wherein the glass structures are silica glass rods 1 mm to 1.5 mm in outside diameter and the non-glass structures are graphite tubes 1 mm to 1.5 mm in outside diameter and 0.8 mm to 1.4 mm in inside diameter.

17. The method of claim 16 wherein fusion temperature is 10°C to 100°C below the softening point of the glass and the draw temperature is 10°C to 50°C below the softening point of the glass.

18. Glass holey fiber of an outside diameter of 20 microns to 5 mm having longitudinal and round channels therein of a diameter of 0.1 micron to 100 microns, wherein the channels are

disposed in the fiber in a desired arrangement wherein center-to-center distances between the channels vary less than 2% along the length of the fiber.

19. The fiber of claim 18 with outside diameter of 100 microns to 500 microns and channel diameter of 0.5 micron to 20 microns wherein each channel in the fiber has a diameter that varies less than 2%.

20. The fiber of claim 19 with a hollow core and arrangement of the channels is such as to impart photonic band gap effect so that light transmitted through the hollow core is directed into the hollow core thereby.